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(54) Apparatus and method for transmitting and receiving a RACH signal in SC-FDMA system

(57) Embodiments of the present invention may provide an apparatus and a method for transmitting and receiving a random access channel (RACH) in a single carrier-frequency division multiple access (SC-FDMA) system. A frequency domain RACH signal may be mapped to a localized sub-frequency band of an entire frequency band available to the SC-FDMA system. A guard band including at least one sub carrier may be allocated between the RACH signal band and other channel signal bands. A guard time may be allocated between the RACH signal and other channel signals in the time domain. The RACH signal may include a short message including information related to a mobile station. The RACH signal may be detected in a frequency based method, a time based method or a sliding matched filter based method. Receiver complexity can be decreased if the RACH signal includes a CAZAC code sequence for a preamble. In such a case, a receive delay may be simply calculated and then adjusted more accurately.

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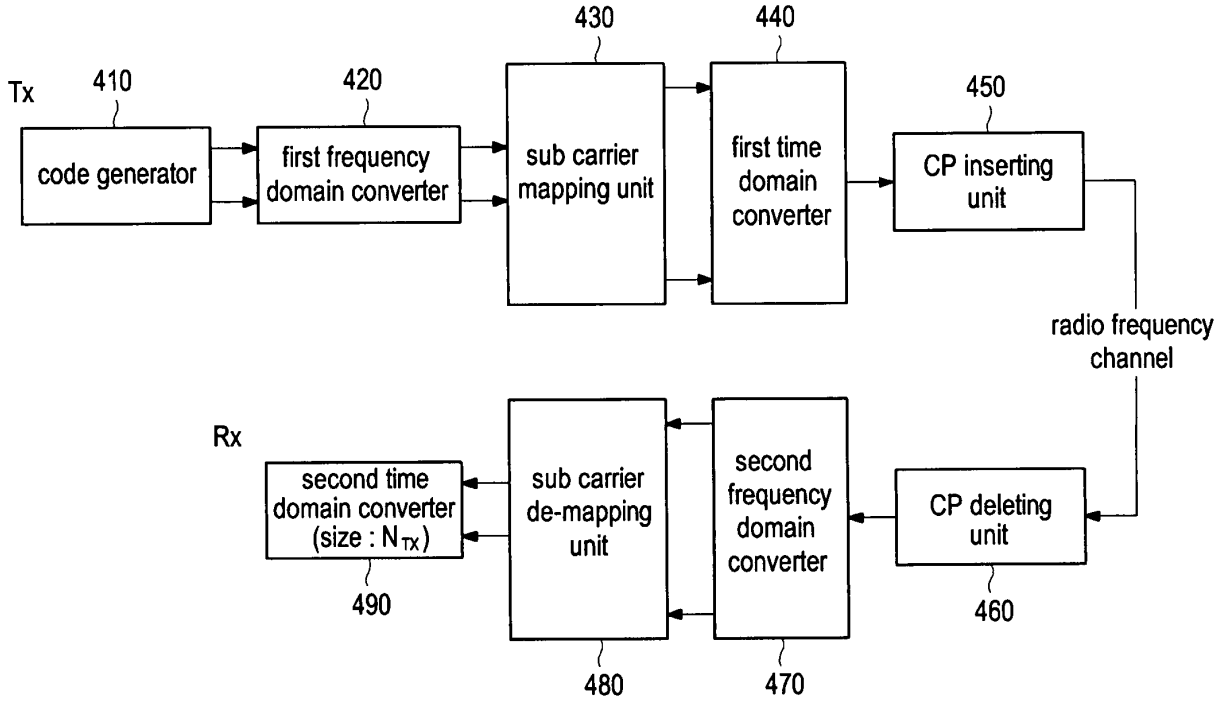
(Cont. next page)

FIG. 4


Tx
410
code generator
420
first frequency domain converter
430
sub carrier mapping unit
440
first time domain converter
450
CP inserting unit
radio frequency channel
Rx
second time domain converter (size : N_{TX})
490
sub carrier de-mapping unit
480
second frequency domain converter
470
CP deleting unit
460

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Application Number
EP 07 00 1190

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Y		2,4-11, 13,15, 18,31, 33, 35-42, 44,46, 49,62	
A		26-29, 57-60	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 September 2007	Baltersee, Jens

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X : particularly relevant if taken alone
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Y A		25,56 26-29, 57-60	
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Y		22,23, 53,54	

X	XIAOYU FU ET AL: "Initial uplink synchronization and power control (ranging process) for OFDMA systems" GLOBAL TELECOMMUNICATIONS CONFERENCE, 2004. GLOBECOM '04. IEEE DALLAS, TX, USA 29 NOV.-3 DEC., 2004, PISCATAWAY, NJ, USA,IEEE, 29 November 2004 (2004-11-29), pages 3999-4003, XP010758486 ISBN: 0-7803-8794-5 * page 3999 - page 4000, Section II. Signal Model * * page 4000, Section III. Proposed Ranging Algorithm *	24,55	
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Application Number
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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 07 00 1190

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-3, 12, 14, 16, 17, 30, 32-34, 43, 45, 47, 48, 61

   Enabling easy separation of users
   ---

2. claims: 4, 15, 18, 26-29, 35, 46, 49, 57-60

   Generation of a RACH signal of low peak average power ratio / Decreasing complexity of RACH detection
   ---

3. claims: 5-11, 13, 31, 36-42, 44, 62

   Enabling efficient preamble transmission
   ---

4. claims: 13, 31, 44, 62 (partially)

   Enabling determination of a processing order at the receiver
   ---

5. claims: 13, 31, 44, 62 (partially)

   Enabling power control
   ---

6. claims: 13, 31, 44, 62 (partially)

   Enabling adjustment of the transmission speed
   ---

7. claims: 13, 31, 44, 62 (partially)

   Enabling adaptive coding and modulation
   ---

8. claims: 13, 31, 44, 62 (partially)

   Enabling determination of the purpose of a call
   ---

9. claims: 13, 31, 44, 62 (partially)

   Enabling identification of a mobile station
   ---

10. claims: 19-25, 50-56

    Enabling adjustment of the RACH window

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 00 1190

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